

REMARKS

Claims 1-14 are pending. Claims 12-14 are indicated as allowable. The previous rejections have been withdrawn in response to Response B. The examiner's indication of allowable subject matter is acknowledged and appreciated. Claims 12-14 are not written in independent form with this amendment, as Applicants traverse the rejections based upon Gamal.

An informality is pointed out in claim 11, and this served as a basis for the objection to claims 11-14. Applicants' appreciate the examiner's attention to this matter. An amendment has been made, though not in the exact form suggested. As amended, the phrase in claim 11 now reads "the linear estimate's output distribution".

Claims 1-7 and 9-11 stand rejected under §102 in view of Gamal, U.S. Patent 6,671,338. The rejection is respectfully traversed.

The fundamental premise in the office action to construct the theory of the rejection is that Gamal's MMSE Transversal Filter performs equalization. This is incorrect. When properly interpreted, it is clear that Gamal does not disclose MMSE equalization, which concerns addressing intersymbol interference, or dispersion, and additive noise specifically induced by a dispersive communication channel.

The claims adequately define equalization. Claim 1, for example, states steps including an MMMSE equalization using a set of priors on the data, which is output from a noisy channel. Claim 1 requires particular steps by which an SISO MMSE equalization is conducted, and results in mapping the output of the SISO MMSE equalizer onto priors over the symbol values to produce a confidence indication in each of the symbol value estimates as a function of time to be used subsequently by a SISO decoder. Claim 10 specifies a SISO equalization for each channel that also uses a set of priors on the data from the noisy channel. Claim 11 also specifies an SISO MMSE equalizer that produces estimates and an output distribution that are mapped to the set of priors. Claim 11 requires an SISO decoder that exchanges symbol estimates with an SISO MMSE equalizer, wherein the MMSE equalizer produces a linear estimate of the transmitted data and corresponding output distribution of

transmitted symbols, and maps the linear estimate output distribution to an output set of priors over symbols. In summary, each of independent claims 1, 10, and 11 specifies an equalization based upon a set of priors of the channel. The purpose of equalization is to compensate for the dispersive artifacts of the channel, which is known to be dispersive. The office action fails to recognize that Gamal conducts an MMSE signal separation (interference cancellation) and subsequent decoding using information from multiple channels. As any artisan would recognize, Gamal's interference suppression operations are not comparable to the equalization defined in independent claims 1, 10, and 11. The difference between Gamal's MMSE filtering and those claimed in 1, 10, and 11 are detailed below.

Gamal does not discuss equalization, but rather interference cancellation. Gamal is concerned with an application, satellite communication, for which equalization is typically nonexistent and not necessary, since the channel response is flat over the spectral content of the transmission. However, of primary importance in satellite communication is interference cancellation of signals sent over adjacent frequency channels that (partially) spectrally overlap. Gamal seeks to address this problem, and does not discuss the equalization of a channel. The MMSE discussed in Gamal is referred to as a "MMSE Transversal Filter" in FIG. 7 and an "Interference Canceller" in FIG. 6, contrary to the examiner's labeling of it as an "MMSE Equalizer". An equalizer serves the purpose of removing intersymbol interference that arises due to temporal dispersion (spreading in time) of the transmitted data over a given channel, whereas Gamal is concerned with effect of adjacent channels. Indeed, in column 8, at line 25, Gamal explicitly states (in contrast to the theory throughout the rejection) that the pulse shaping in the preferred satellite communication permits an assumption that a selected pulse "satisfies the Nyquist criterion of zero inter-symbol interference." The difference is important, and the details of the algorithms developed in Gamal for interference cancellation are different from the technique specified in each of the independent claims 1, 10 and 11.

Throughout, Gamal's algorithms apply this assumption of zero intersymbol interference, and all of the algorithms in columns 8-10 rely on this assumption. Column 13,

lines 4 et seq. does mention single channel decoding, but again concerns use of information from multiple channels and interference cancellation, as opposed to equalization. Column 13 addresses a special case of adjacent channel interference considered with reference to FIG. 7. Rather than having multiple independent signals in adjacent channels, now Gamal considers the case that the channel FEC is applied across several of these adjacent channels. Each of the multiple signals corresponding to multiple channels is fed into a matched filter bank. The output is a vector that is subject to interference and spillover from any one of the M signals into adjacent channels (or equivalently signals). In this manifestation of Gamal's techniques, the MMSE transversal filter is still not used to address the self-interference of one signal (and there is no disclosure of how Gamal's algorithms could accomplish the same). Instead, the MMSE transversal filter's role is to mitigate interference from other signals to "suppress the ACI" (column 13, lines 15-16).

With regard to claim 2, Gamal does set the parameters of an MMSE Transversal Interference Canceller (for adjacent channel interference) according to an MMSE criterion over the channel noise and the interference signals, however this does not teach MMSE equalization over the intersymbol interference, since the data of interest is also dispersed in time, and a number of factors that arise in the design and use of an equalizer do not, for example, arise in discussion of an ACI Transversal Filter. These include, for example, properly dealing with the high correlations between received data symbols, due to the spreading of the transmitted signal in time (dispersion), in order to obtain well-behaved iterative equalization and decoding. Similarly, the structure of the correlations from one symbol to the next can be conveniently aligned into a fast, recursive update of the MMSE filter coefficients, something that is not even considered in Gamal, cannot be inferred from, and is not taught in Gamal (contrary to the examiner's theory of obviousness for claim 7).

Regarding claims 5 and 6, the theory of the rejection is incorrect because in Gamal's interference cancellation the information from an adjacent channel is clearly not a function of a symbol being decoded. There is no reason to exclude symbol value estimates of a symbol being equalized when such estimates are non-existent, as they are in the techniques

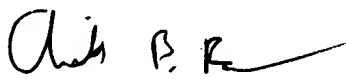
of Gamal. Symbol estimates are not formed in Gamal, and Gamal does not conduct any symbol value mapping that excludes symbol value estimates of the current symbol being equalized, as in claim 5.

Gamal also discloses a batch algorithm, with the same transversal filter for an entire iteration. The algorithms in the present application and the methods specified in the claims, and with particularity in claims such as claim 9, for example, is time-recursive with a different set of equalizer coefficients for each output data symbol.

Applicants also separately traverse the §103 rejection of claims 7, 8, and 12. The examiner is using the present specification as evidence, and the prior comments regarding the specification. This is never appropriate evidence of obviousness, as the determination must be made without hindsight knowledge of the present teachings. As detailed in Amendment A, the present specification teaches a power of 3 update, and it is with such teachings that an artisan could understand how to conduct an update to a power of 2. The examiner is not entitled to use the teachings of the present specification to determine that the claims are obvious, but that is exactly what is done in the office action.

For all of the above reasons, applicants request reconsideration and allowance of the present application. Should the examiner believe that a teleconference would resolve any outstanding issues, the examiner is invited to contact the undersigned attorney at the below-listed number.

Respectfully submitted,
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